OBSERVATIONS ON THE LIFE HISTORY OF *GRAPHIUM ARISTEUS PARMATUM* (GRAY) (LEPIDOPTERA: PAPILIONIDAE).

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Abstract

The life history of *Graphium aristeus parmatum* (Gray) is described and its distinctive habit of depositing eggs in clusters is recorded for the first time. Oviposition behaviour, larval feeding, predation of larvae, pupation and habitat details are discussed.

Introduction

The only previous description of the juvenile stages of *Graphium aristeus parmatum* (Gray) was by Waterhouse (1932), repeated by Common and Waterhouse (1981), who gave an incomplete account based on dead and dying larvae although the pupa was described in more detail. Nothing was known of the egg but the foodplant was thought to be one of the larval foodplants of *G. eurypylus* (Linnaeus). The adult was considered uncommon and until recently few have existed in collections. As it was known that *G. aristeus* had been collected on Mt. White (Coen, Queensland) in January 1964 (M.S. Moulds pers. comm.), a visit was made to Mt. White timed for the period about 8-10 days after the first significant wet season rainfall. On the 6th January 1988, adults, eggs and larvae were located at Mt. White and subsequently many larvae were reared in captivity to produce pupae and adults. A comprehensive description of the life history is given below followed by a discussion of adult oviposition and larval behaviour.

Life History

Larval foodplants: Miliusa traceyi Jessup and *Polyalthia nitidissima* (Dunal) Benth. (Annonaceae).

Egg: spherical, smooth, 0.75 mm wide and 1.0 mm high. Cream when first laid, turning pink after 12-24 hours. Eggs laid in clusters, either densely packed on tiny buds or stems of foodplant or more widely spaced on the underside of a foodplant leaf. Eggs hatched in five days.

Larva (Fig. 1): 1st instar. Yellow brown, length 2.5 mm; head black with numerous black bristles; prothoracic plate black; each thoracic segment with a dorsolateral tubercle bearing a rosette of fine black bristles; each segment bearing a transverse row of 8 bristles, each arising from a small black spot; anal plate with a pair of dorsolateral tubercles each bearing 3-5 black bristles. 2nd-4th instar. Chocolate brown, smooth and shining; head and prothoracic

plate black; each thoracic segment with a stout black tubercle dorsolaterally; anal plate with a small black patch and two short tubercles bearing short bristles. 5th instar. Dark form: body black, slightly humped anteriorly; a prominent orange prothoracic plate; each segment with a transverse line of silver spots; reddish brown ventrolateral line; prolegs cream; thoracic segments with short dark blue dorsolateral tubercles; anal plate with paired tubercles. Pale form: body pale orange; head black; prothoracic plate and abdominal segments 9-10 yellow; metathoracic tergum blackish; each segment with a distinct white transverse line edged reddish brown; anal plate yellow with short paired bluish black tubercles. Larval duration in January approximately eight days. About 5% of larvae were pale.

Pupa (Fig. 2): pale brown with variable black mottling; a prominent, flanged, forward-projecting, slightly curved, dorsal thoracic horn; a pair of blunt projections anteriorly; lateral flange on horn extending posteriorly along margins of wing case; a sharp ridge overlying anterior spiracle; abdominal segments with irregular serrated black lines dorsolaterally; metathoracic segment with paired dorsal and lateral black spots. Pupal duration seven days without diapause.

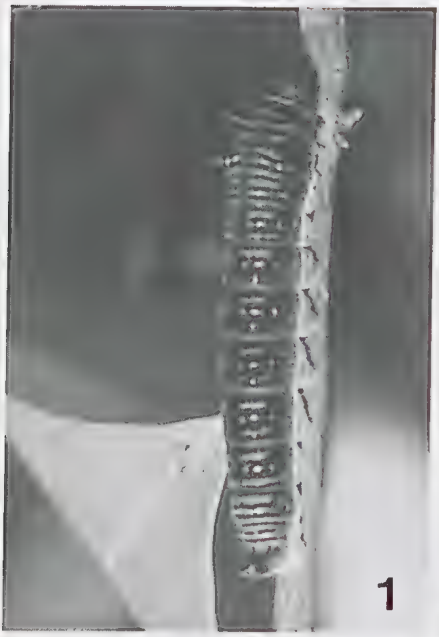

Fig. 1. *Graphium aristeus parmatum*, mature larva.

Fig. 2. *G. aristeus parmatum*, pupa.

Discussion

G. aristeus deposits its eggs in clusters and although many butterfly species deposit eggs in clusters (Stamp 1980, Chew and Robbins 1984), very few papilionids do. In her review paper Stamp (1980) records 107 species which deposit eggs in clusters (>10 eggs per cluster) of which only one was in the family Papilionidae. Wynter-Blyth (1957) gives *Papilio liomedon* Moore as the exception to the rule of single egg laying by papilionids in India. According to Wynter-Blyth the eggs of this species are stacked in groups of about 10 and the larvae are gregarious. More recently, Straatman (1975) described the egg laying habits of *P. laglaizei* Depuiset and *P. toboroi* Ribbe in a paper apparently overlooked by Stamp. Both species lay clusters of up to 500 eggs. Female *G. aristeus* were initially observed ovipositing on *P. nitidissima* where the sites selected included fresh shoots and also twigs adjacent to budding foliage. The number of eggs in a single cluster seemed to depend, in part, on whether the female was disturbed by other butterflies. Clusters observed being deposited by single females comprised 2 (disturbed), 23, 28 and 45 eggs. All eggs on *Polyalthia* were tightly packed in a single layer. At this time these plants had no well-grown fresh shoots.

In the case of the *M. traceyi* plants, the fresh foliage was both more advanced and more prolific and in each instance egg clusters were on the underside of the leaves with a spacing of about 2 mm between each egg. This appears to be the more important foodplant as it produces a very large crop of new leaves all of which are apparently edible. An examination of *M. traceyi* plants along a margin of the vine thicket extending from the base of Mt. White to the summit, revealed several thousand larvae of *G. aristeus*, with some individual trees containing several hundred larvae.

During the early instars larvae are strongly gregarious, typically feeding simultaneously along a leaf edge. At this stage they closely resemble the larvae of sawflies and their habit of raising the thoracic segments above the leaf surface adds to this impression. Later instars stay together in smaller groups but the final instar larvae disperse. All larval stages were preyed upon greatly by green tree ants (*Oecophylla smaragdina* F.), which presumably play an important role in population control. There was an extremely high survival rate of larvae reared in captivity, even amongst those collected as final instars, suggesting that larval parasitism is at a low level in this early summer brood. Of 120 larvae reared on *M. traceyi* or *P. nitidissima* only three failed to pupate. About 30 of these were still in diapause in September 1988 but all emerged during humid weather in December.

Although pupation was not observed under natural conditions, larvae kept confined on a large branch of the foodplant chose sites on either leaves of the foodplant or on twigs or stems. It appeared that some larvae attempted to descend to the base of the foodplant and it seems likely that they may disperse amongst rocks and litter on the ground. This hypothesis is supported by the adult emergence behaviour and the colour of the pupa. Approximately 30% of the pupae gave rise to adults within a week or so of pupation. The remainder entered diapause. Upon emerging the adult is extremely active and scurries around on the ground until it finds a suitable location to inflate its wings. Both the cremaster attachment and the girdle are frail. The cryptic

coloration of the pupa and the agility of the newly emerged imago suggest that pupal dislodgement occurs frequently in the field particularly during a prolonged diapause. It is anticipated that those entering diapause may remain so until the following wet season. Forty pupae were sprayed with water every two days and this succeeded in breaking diapause in two or three pupae on each exposure. Of 20 untreated pupae in Townsville, which had been in diapause for several weeks, two emerged during the high relative humidity associated with cyclone "Charlie" (29th February, 1st March, 1988).

G. aristeus appears to be a butterfly of deciduous vine thickets. During a January visit to Mcllwraith Range east of Coen adults were noted in vine thickets at the base of the range. On Mt. White the females were distributed widely over the entire hill as larvae were found from near the base up to the summit. Both foodplants are common elements of the Mt. White vine thicket. The adult butterflies were present in some numbers at the summit with males aggressively defending territory and attacking many other butterfly species. Females were frequently seen flying around the foodplants and many were observed ovipositing on *P. nitidissima*. No larvae were found on this species but eggs brought back to Townsville were reared on fresh shoots of this plant. In addition, some larvae were offered *Annona muricata* (soursop). All first instar larvae died when fed solely on soursop leaves, however, one of several transferred to it at the third instar stage managed to survive, pupate and emerge, but this represented a very high mortality rate. The progress of the larvae on soursop was very slow. It is of interest to note that larvae of *G. eurypylus lycaeon* (C. & R. Felder) also feed upon *P. nitidissima* (Common and Waterhouse, 1981). Larvae of both *G. eurypylus* and *G. agamemnon ligatum* (Rothschild) were found on *M. traceyi* on Mt. White.

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